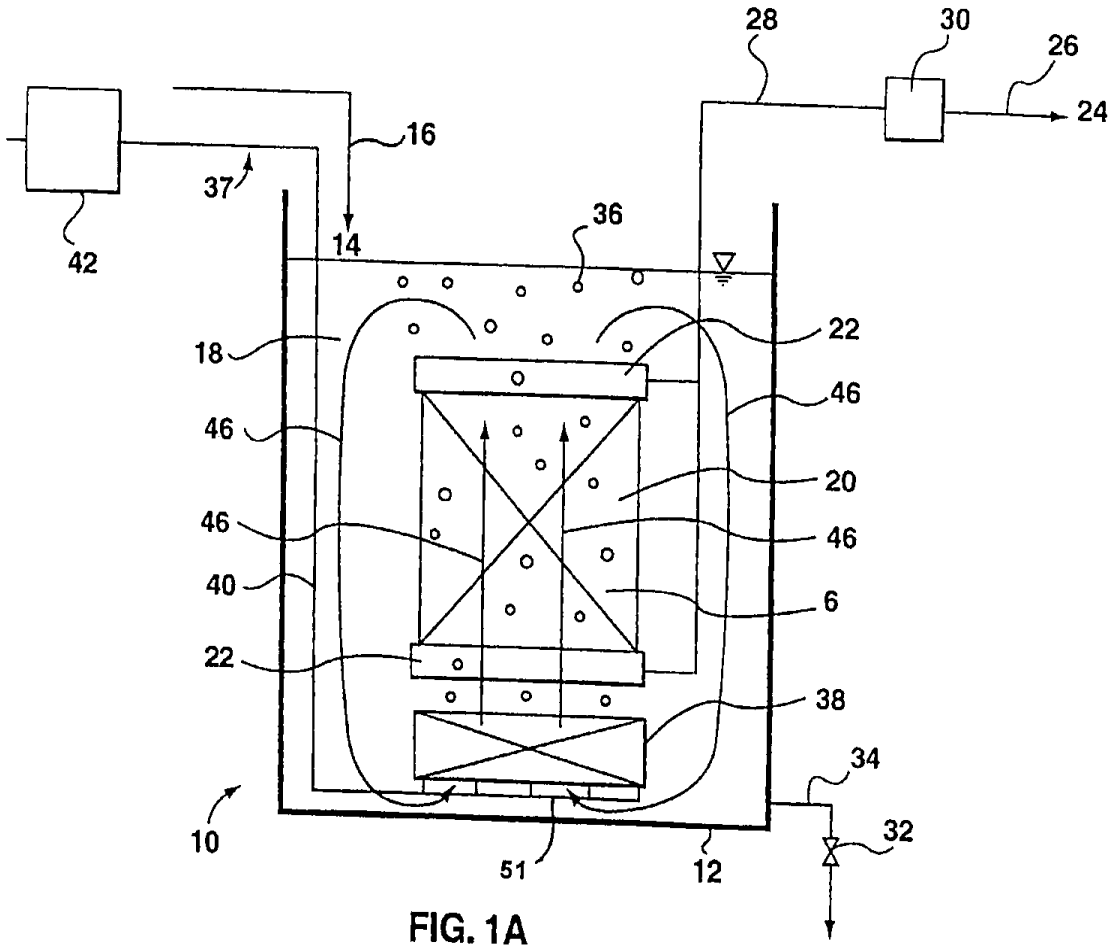


FIG. 1A

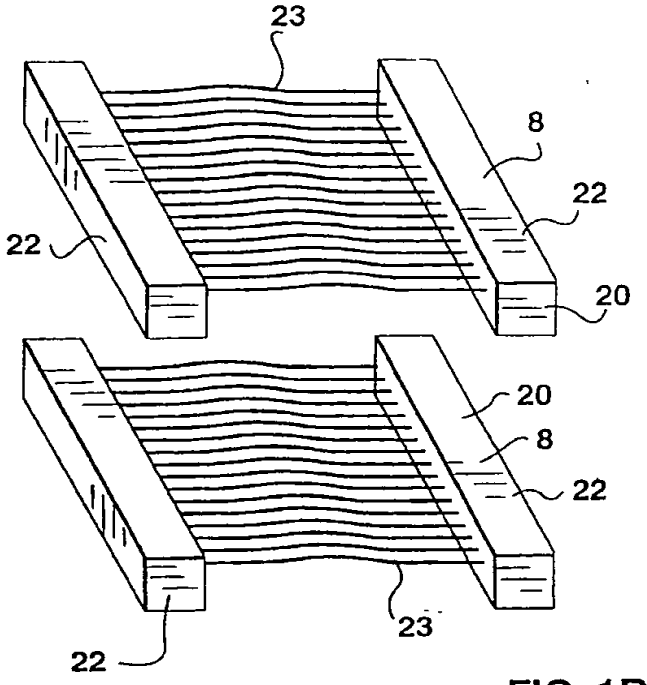


FIG. 1B

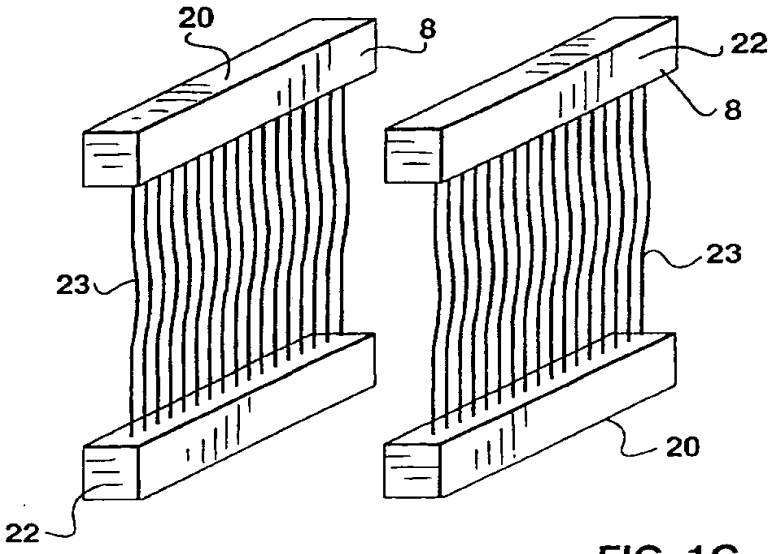


FIG. 1C

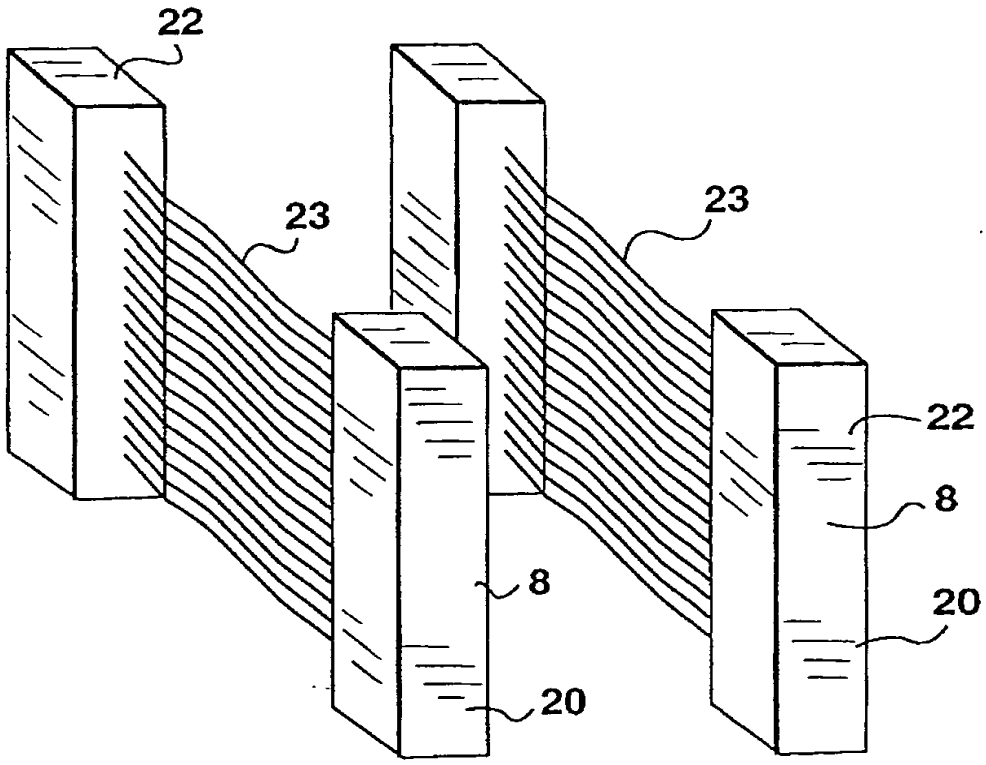


FIG. 1D

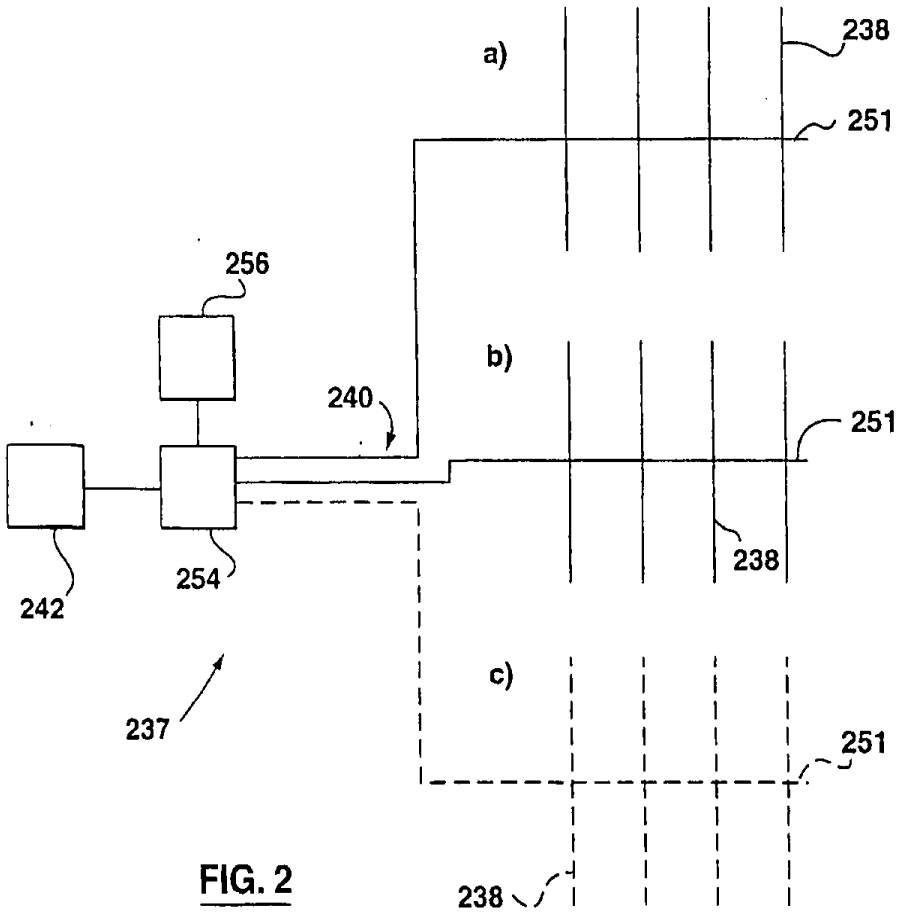

a)
238
251
256
b)
240
251
238
254
242
237
c)
251
238

FIG. 2

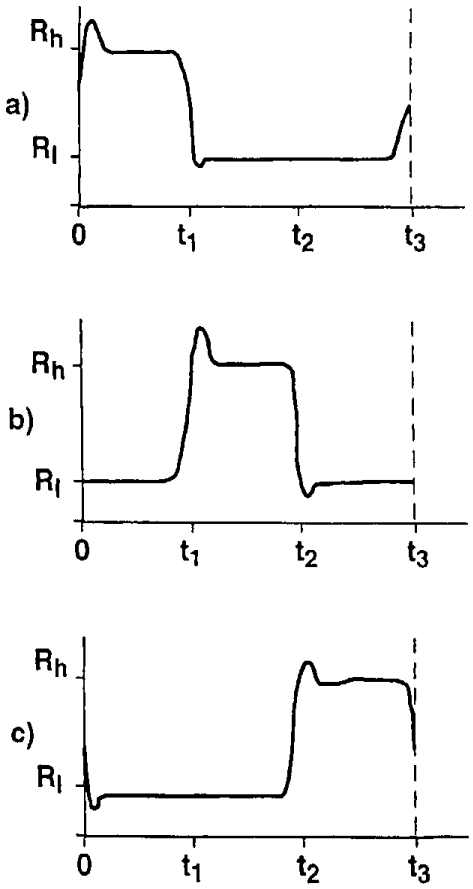

Rh
a)
Rl
0
t1
t2
t3
Rh
b)
Rl
0
t1
t2
t3
Rh
c)
Rl
0
t1
t2
t3

FIG. 3

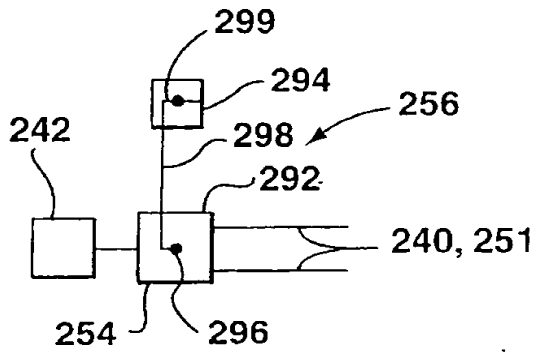

299
294
256
242
298
292
240, 251
254
296

FIG. 4A

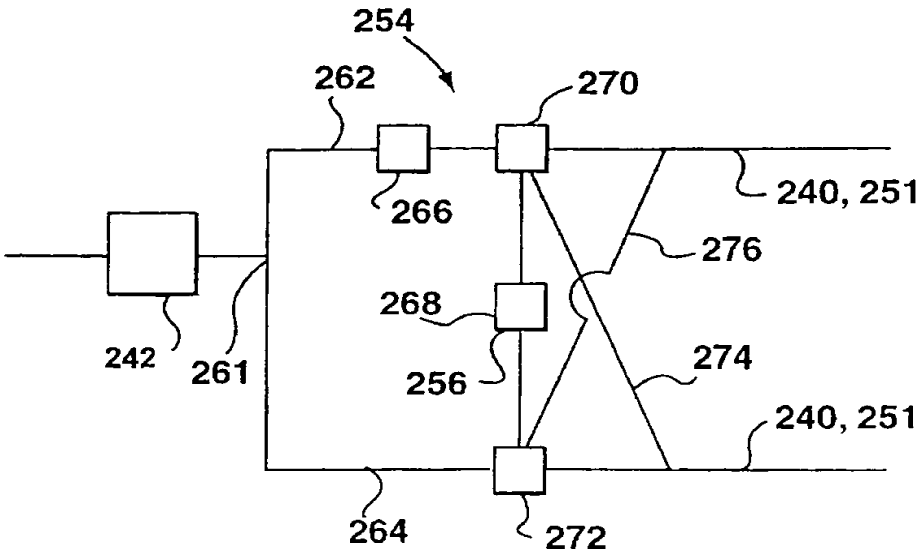

254
262
270
266
240, 251
276
268
242
261
256
274
240, 251
264
272

FIG. 4B

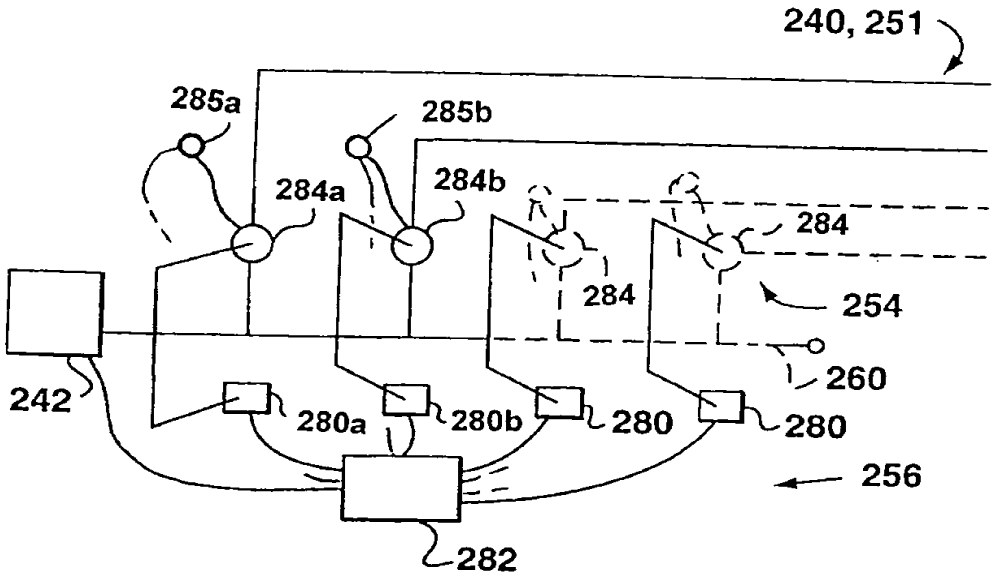

240, 251
285a
285b
284a
284b
284
284
254
260
242
280a
280b
280
280
256
282

FIG. 4C

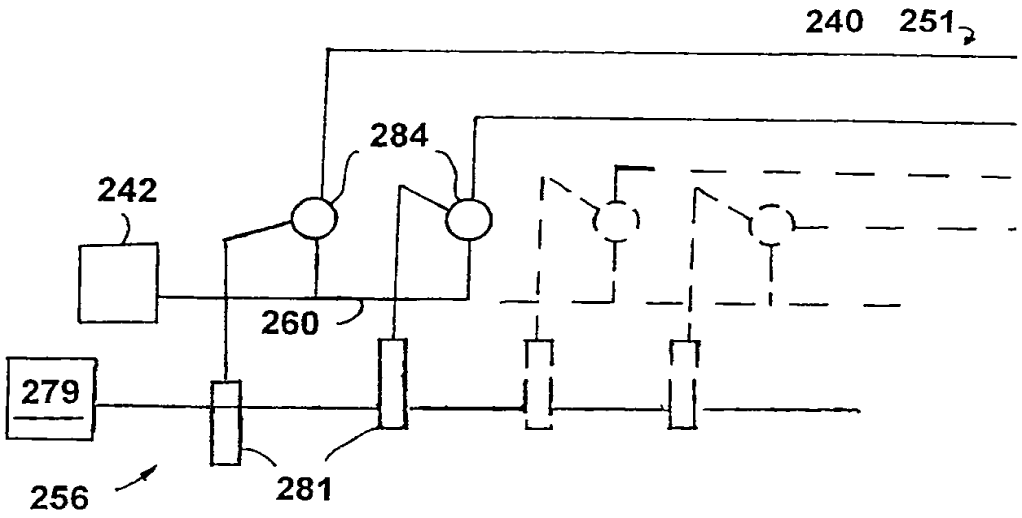


FIGURE 4D

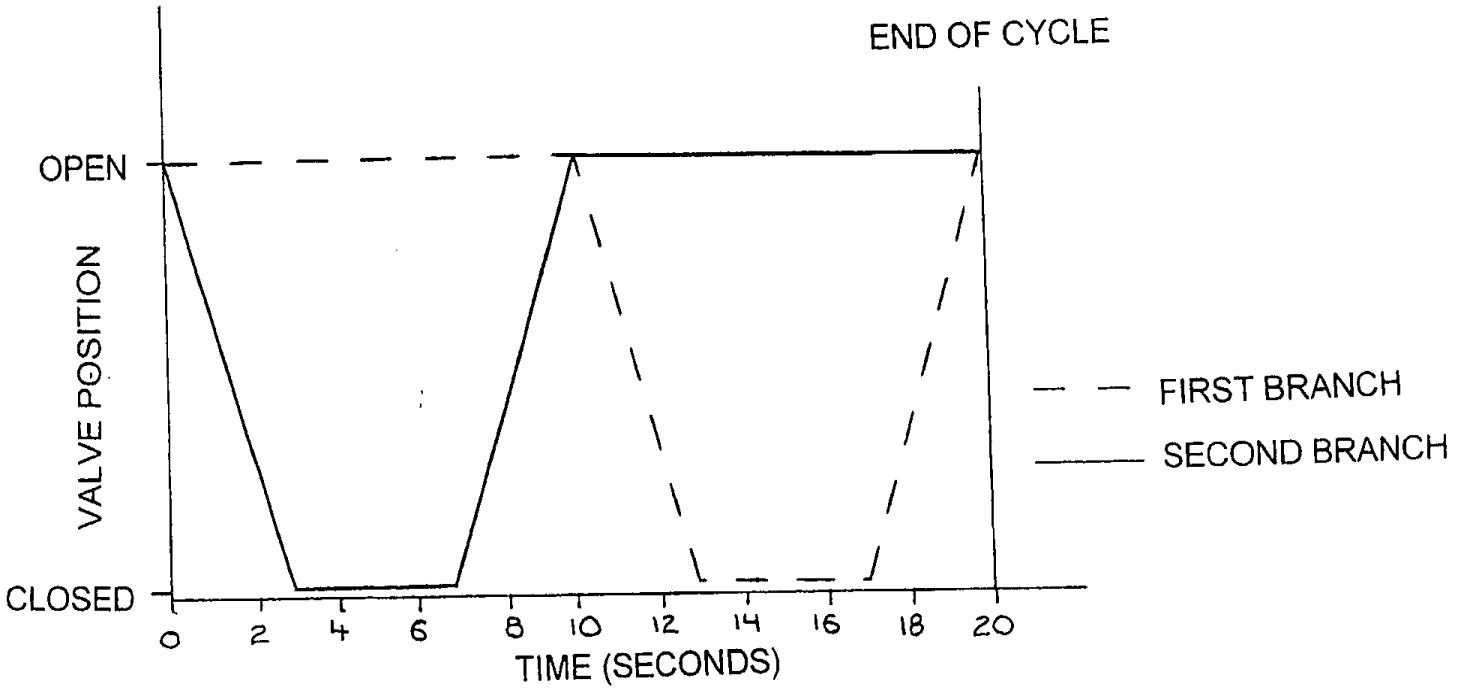

END OF CYCLE
OPEN
VALVE POSITION
CLOSED
0
2
4
6
8
10
12
14
16
18
20
TIME (SECONDS)
FIRST BRANCH
SECOND BRANCH

FIGURE 4E

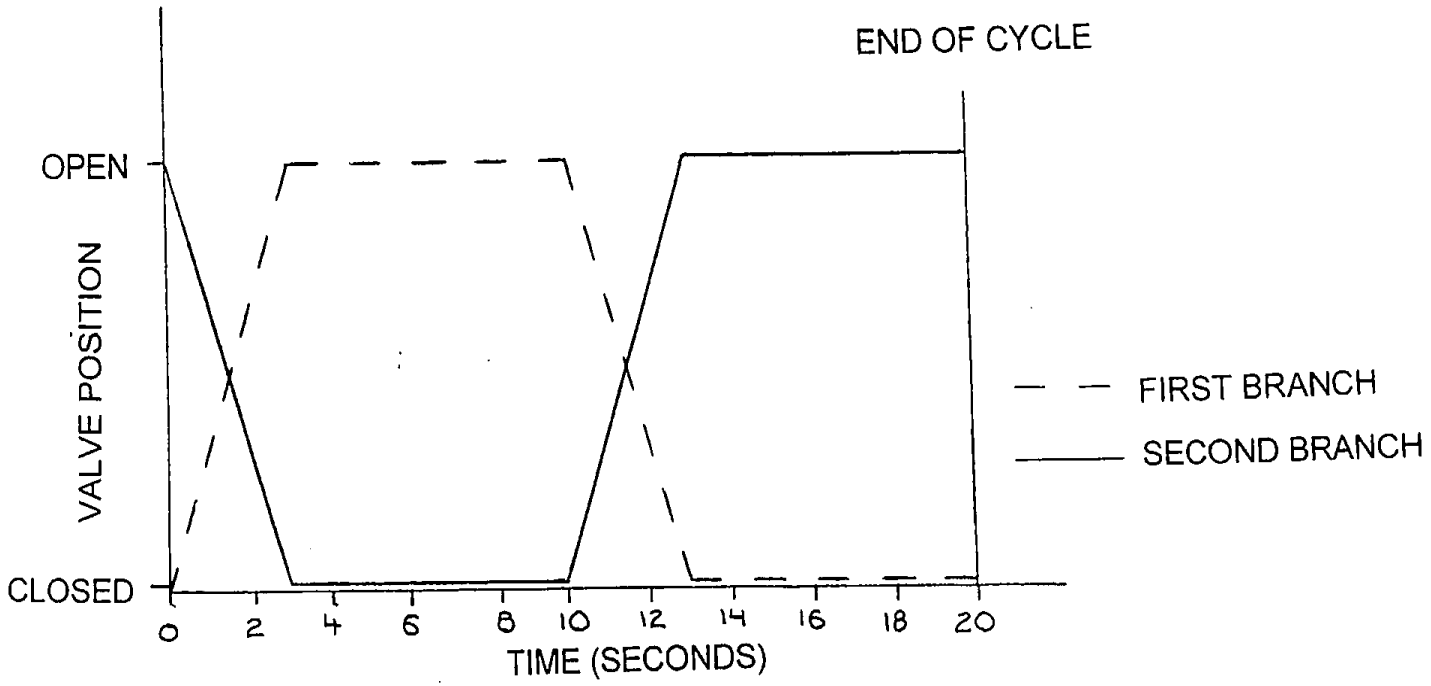

END OF CYCLE
OPEN
VALVE POSITION
CLOSED
0
2
4
6
8
10
12
14
16
18
20
TIME (SECONDS)
FIRST BRANCH
SECOND BRANCH

FIGURE 4F

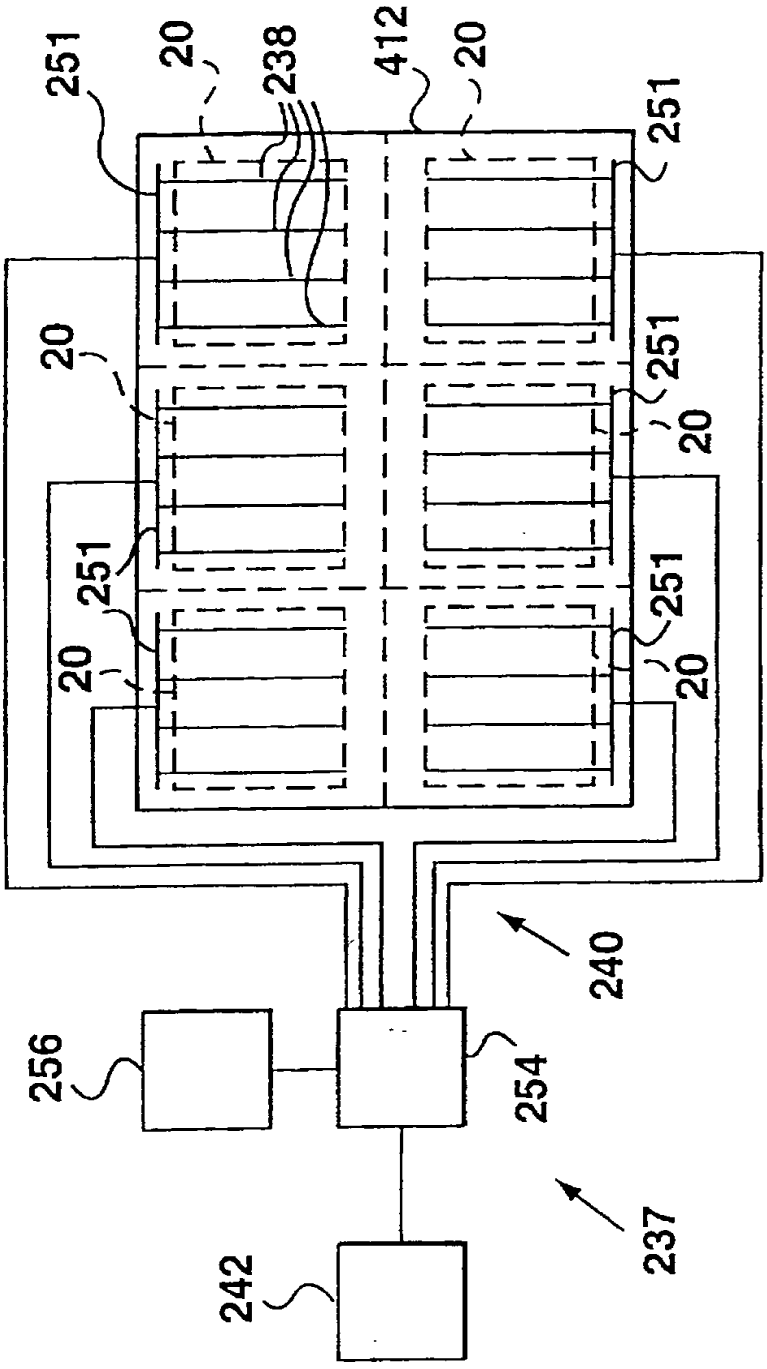

251
20
238
412
20
251
20
251
20
251
20
251
20
20
240
256
254
237
242

FIG. 5

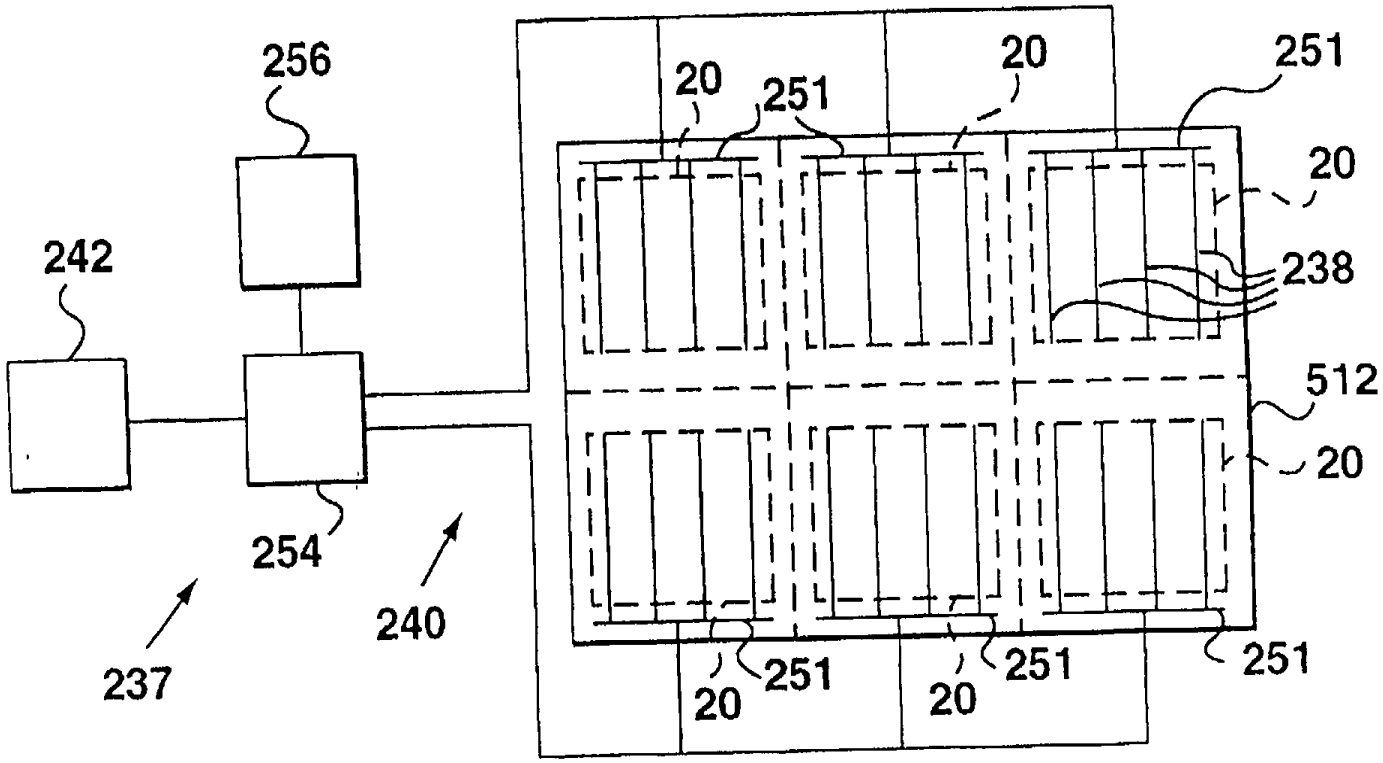


FIG. 6

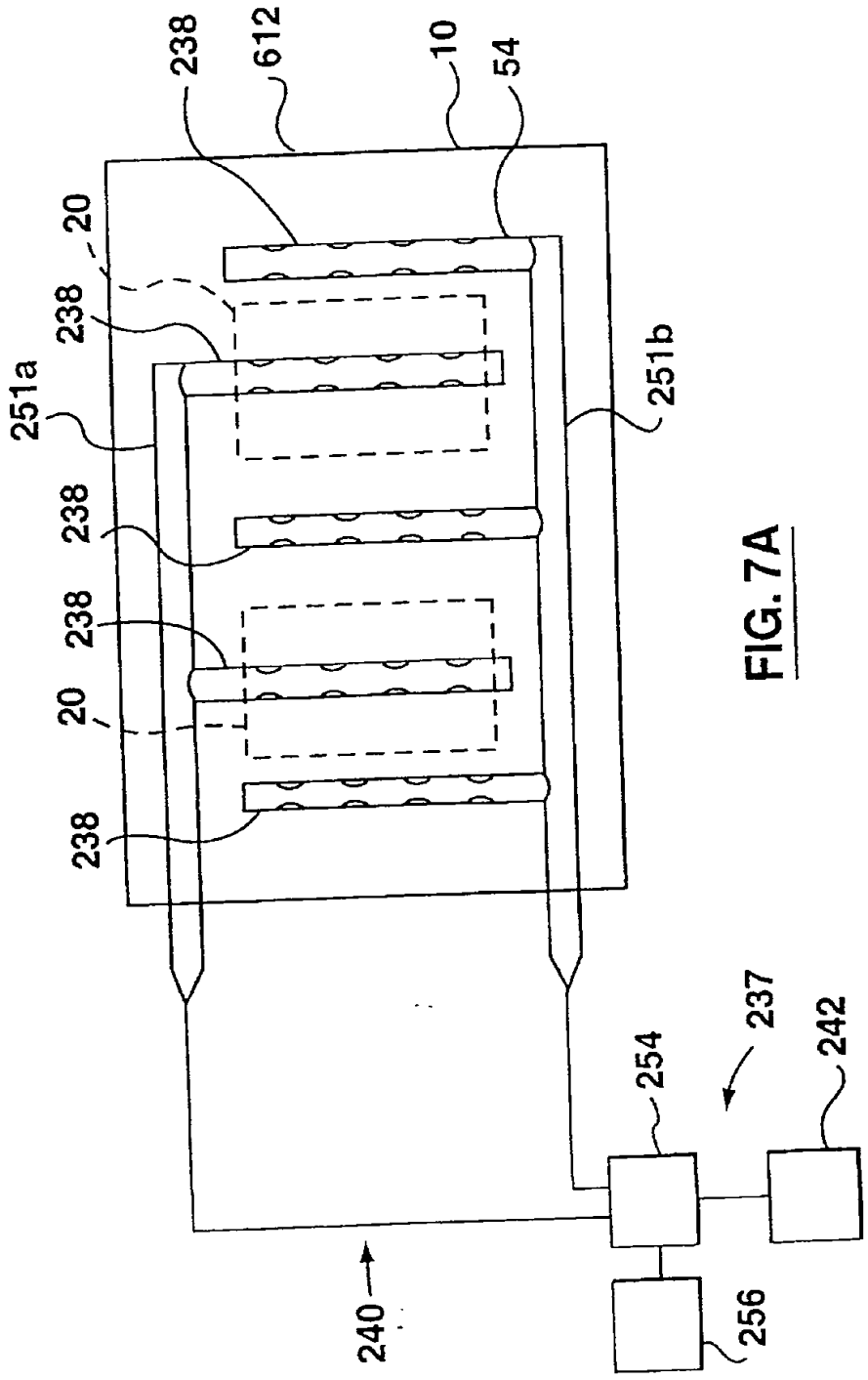


FIG. 7A

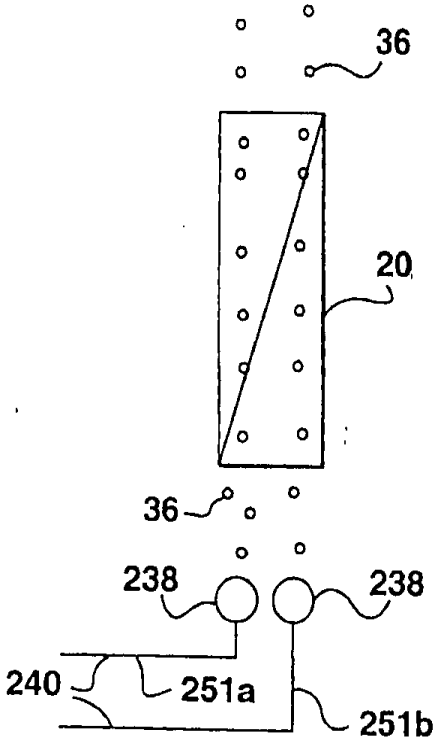


FIG. 7B

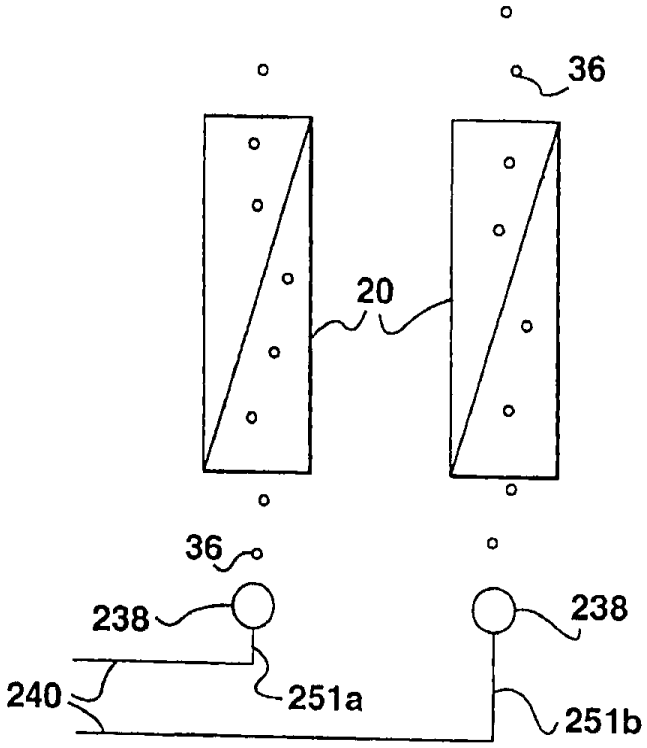


FIG. 7C

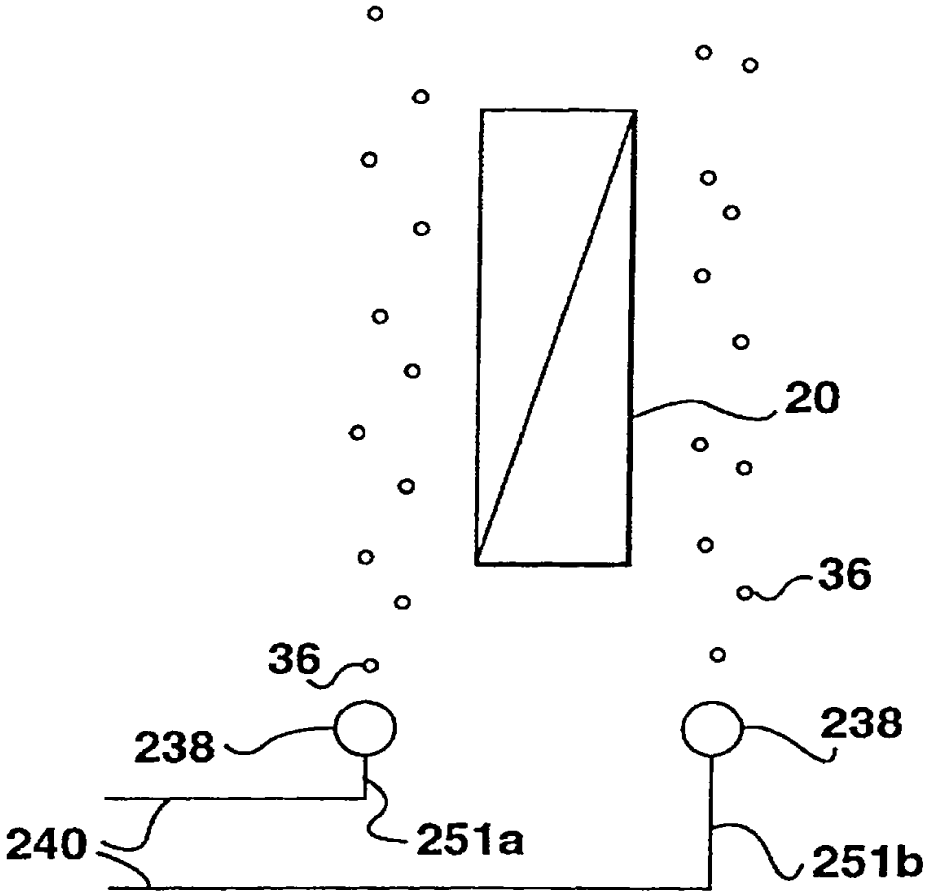


FIG. 7D

FIG. 7E

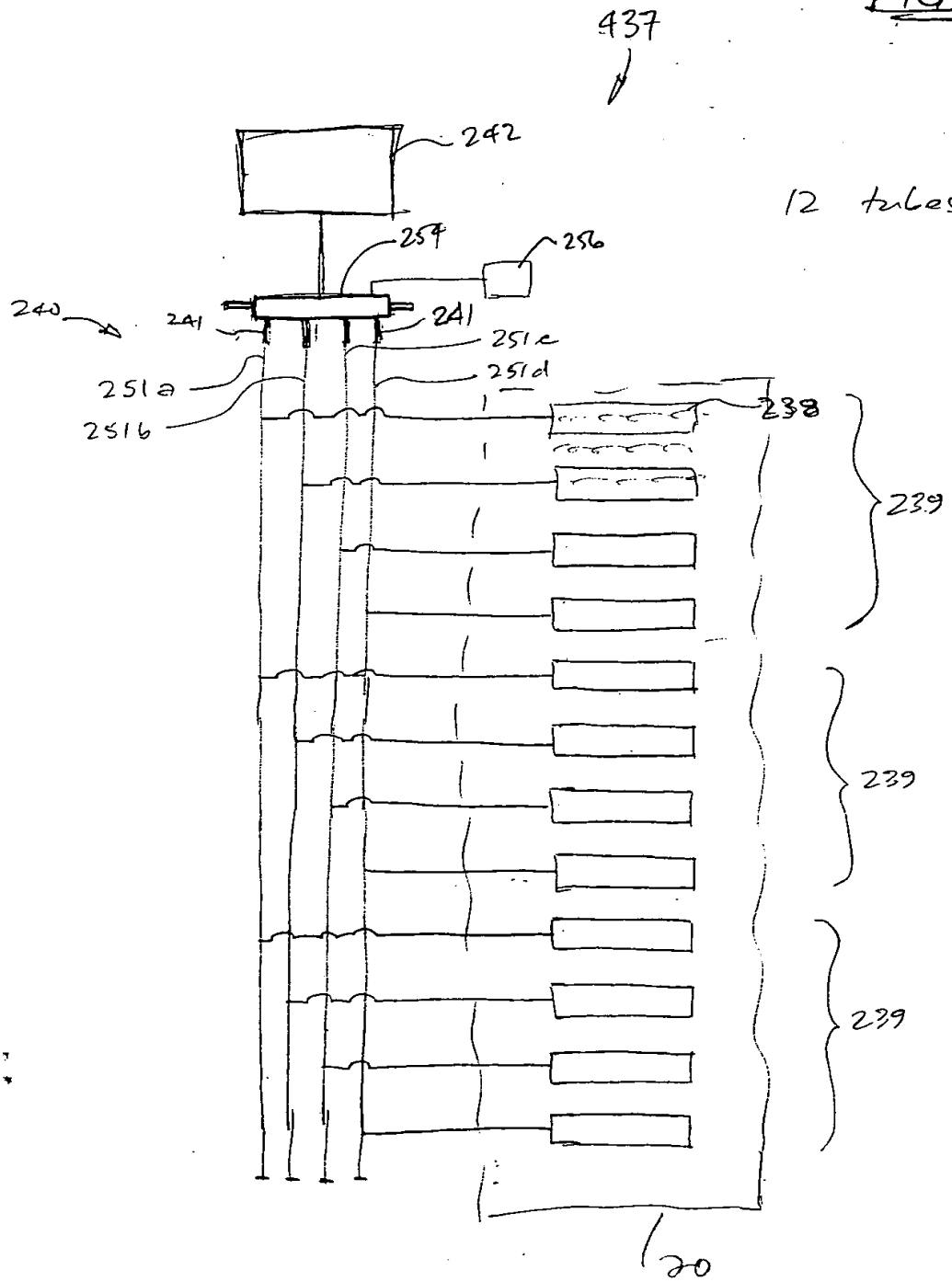

437
242
12 tubes
254
256
240
241
241
251c
251d
251a
251b
238
239
239
239
20

Fig 7F

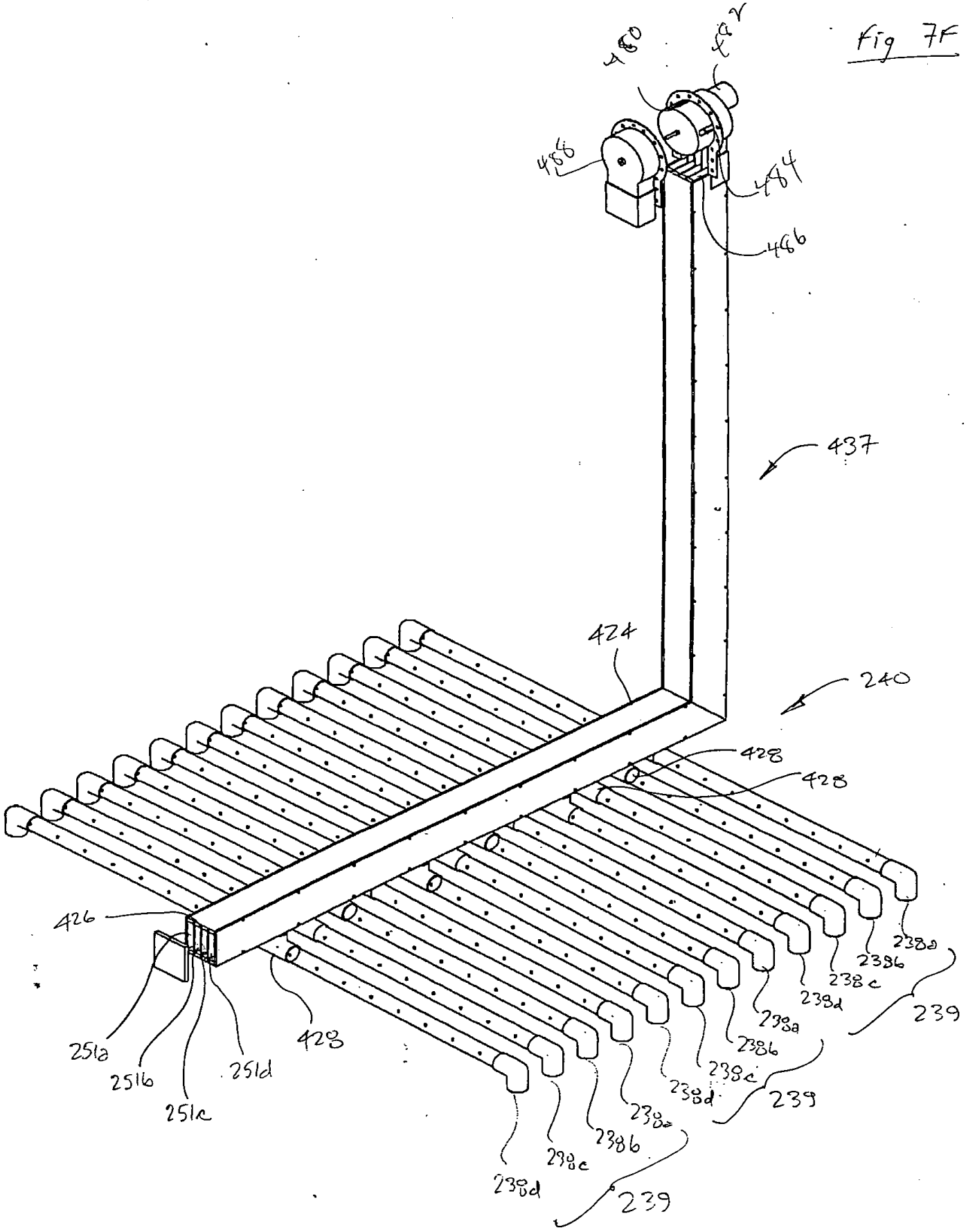
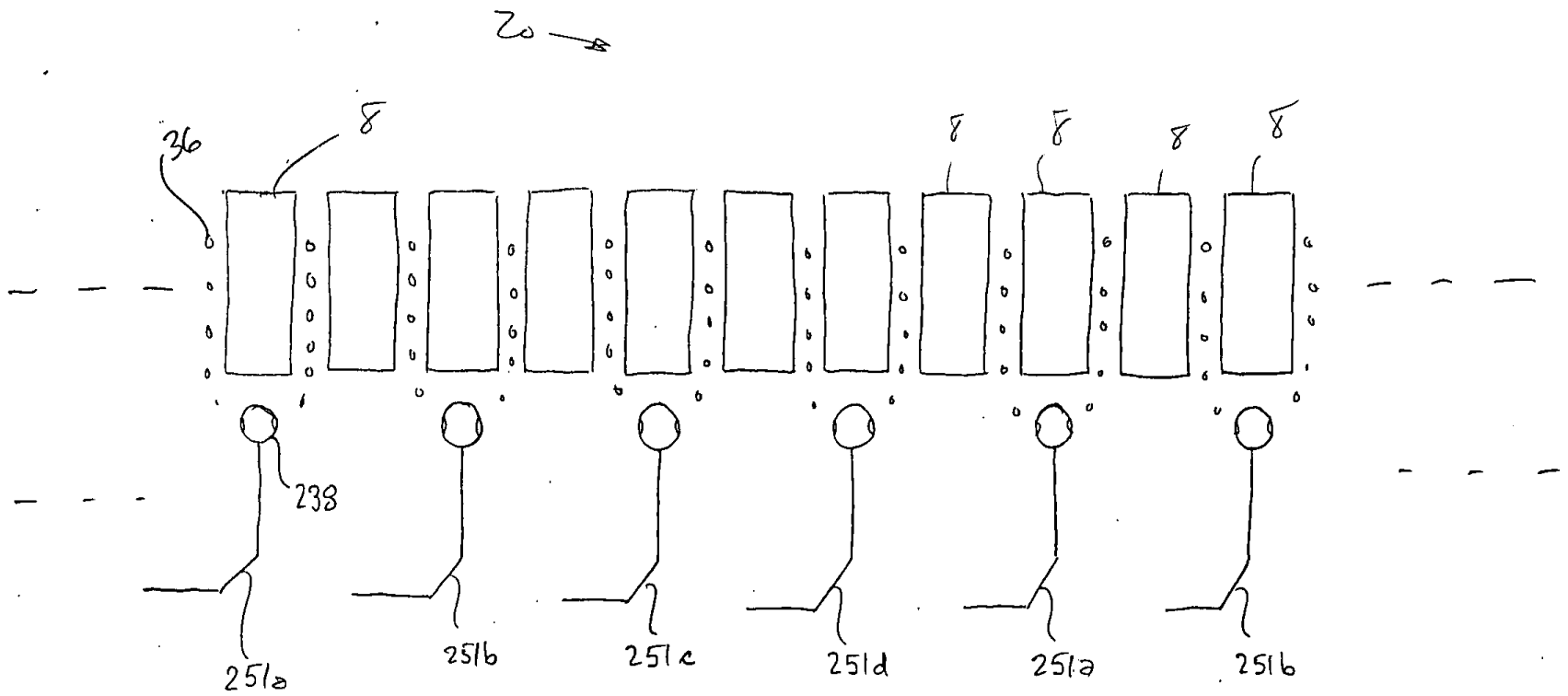

486
484
486
437
424
240
428
428
426
428
251a
251b
251c
251d
238a
238b
238c
238d
239
238a
238b
238c
238d
239
238a
238b
238c
238d
239

Fig. 7G



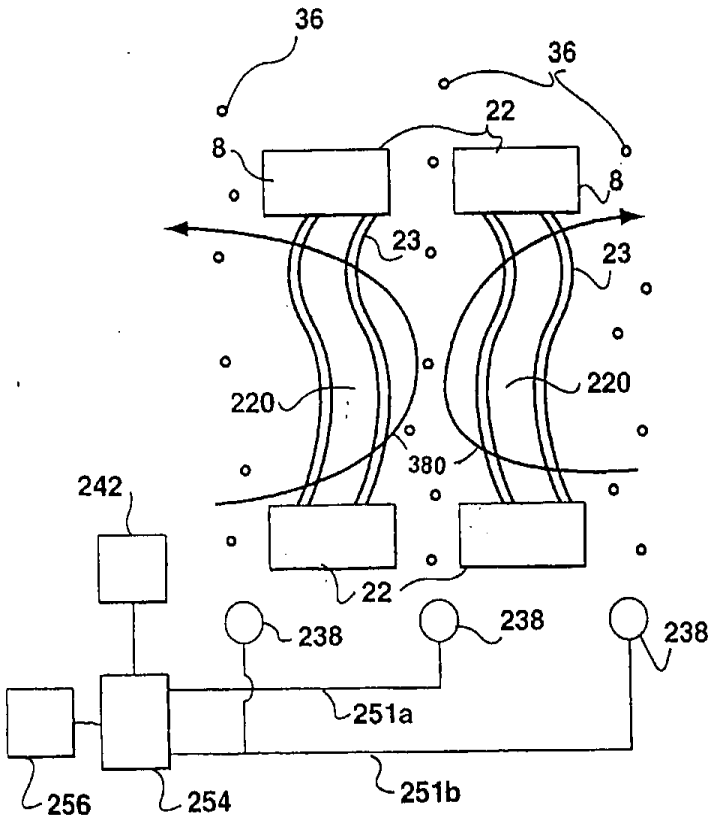

36
36
22
8
8
23
23
220
220
380
242
22
238
238
238
251a
251b
256
254

FIG. 8A

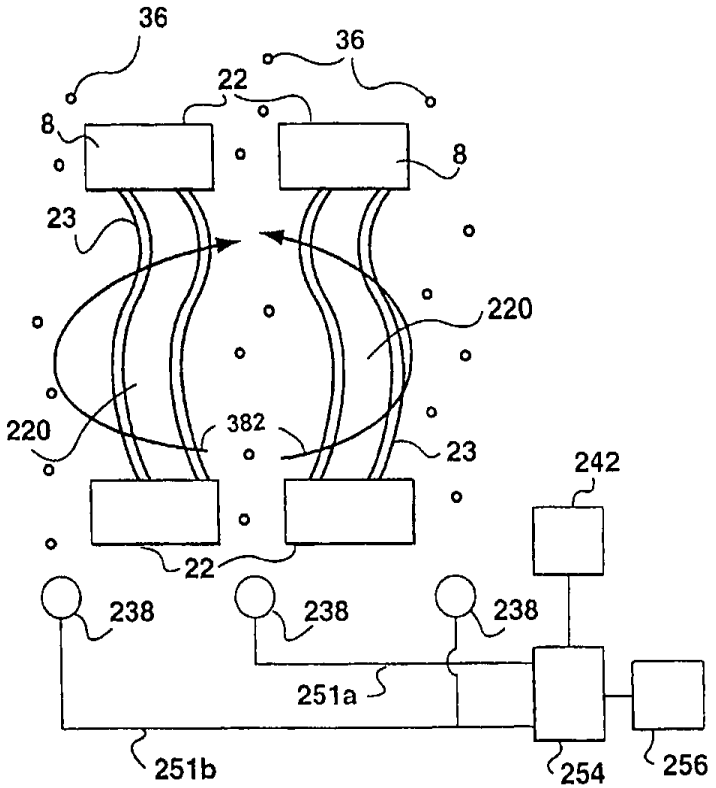

36
36
22
8
8
23
220
220
382
23
242
22
238
238
238
251a
251b
254
256

FIG. 8B

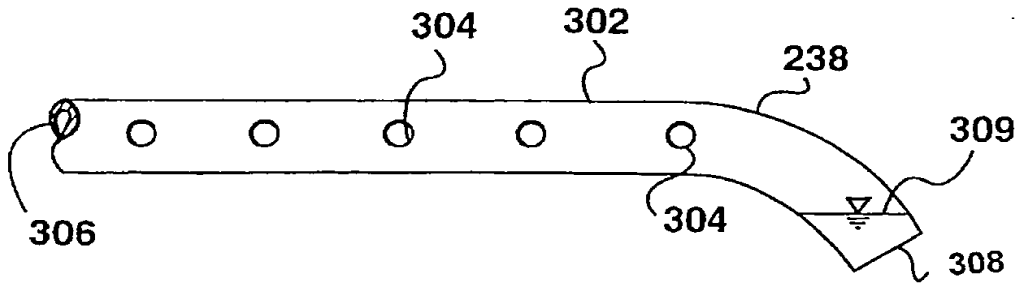


FIG. 9A

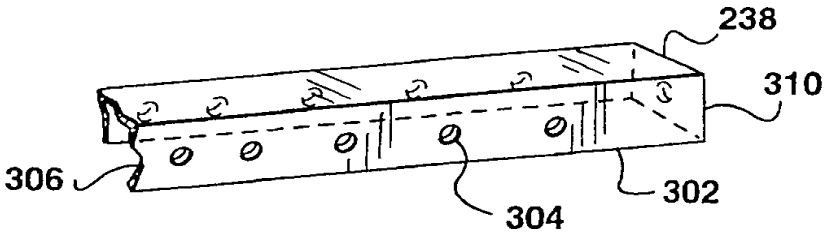


FIG. 9B

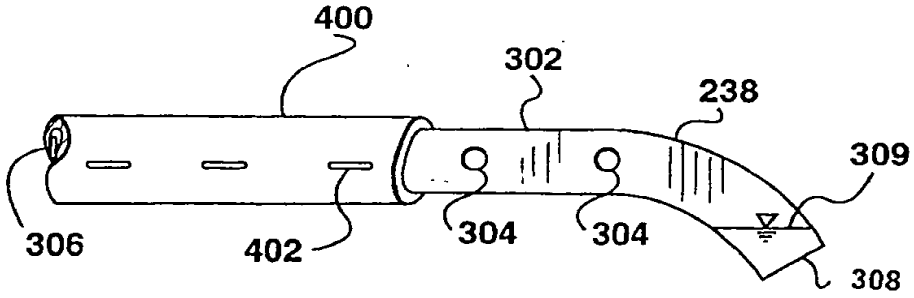


FIG. 9C

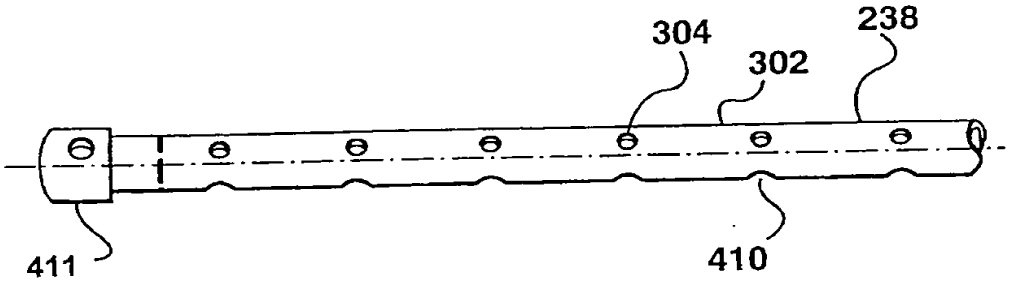


FIG. 9D

FIGURE 9E

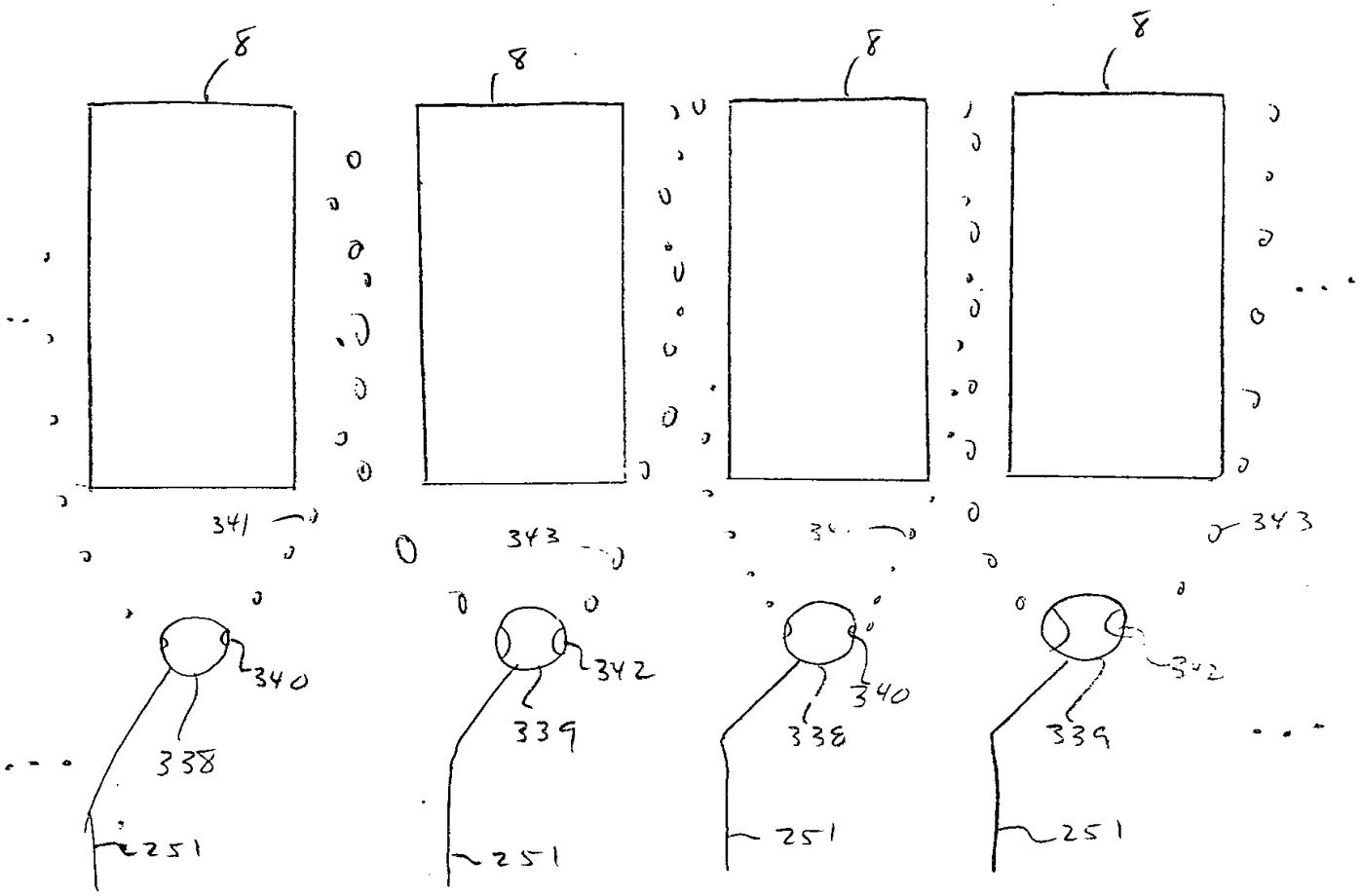

20
8
8
8
8
341
343
343
340
342
340
342
338
339
338
339
251
251
251
251

FIG. 9F

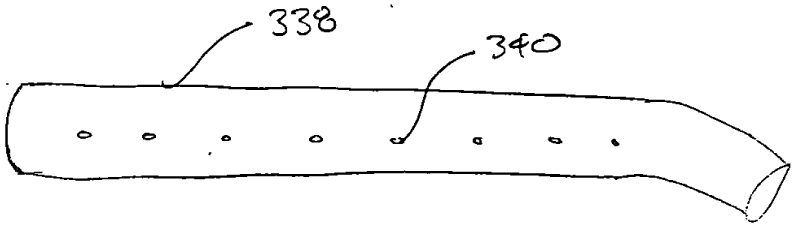
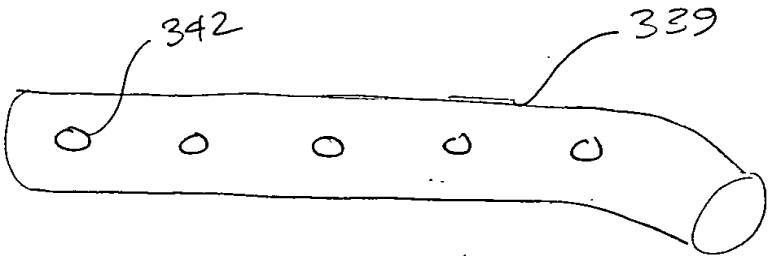


FIG. 9G



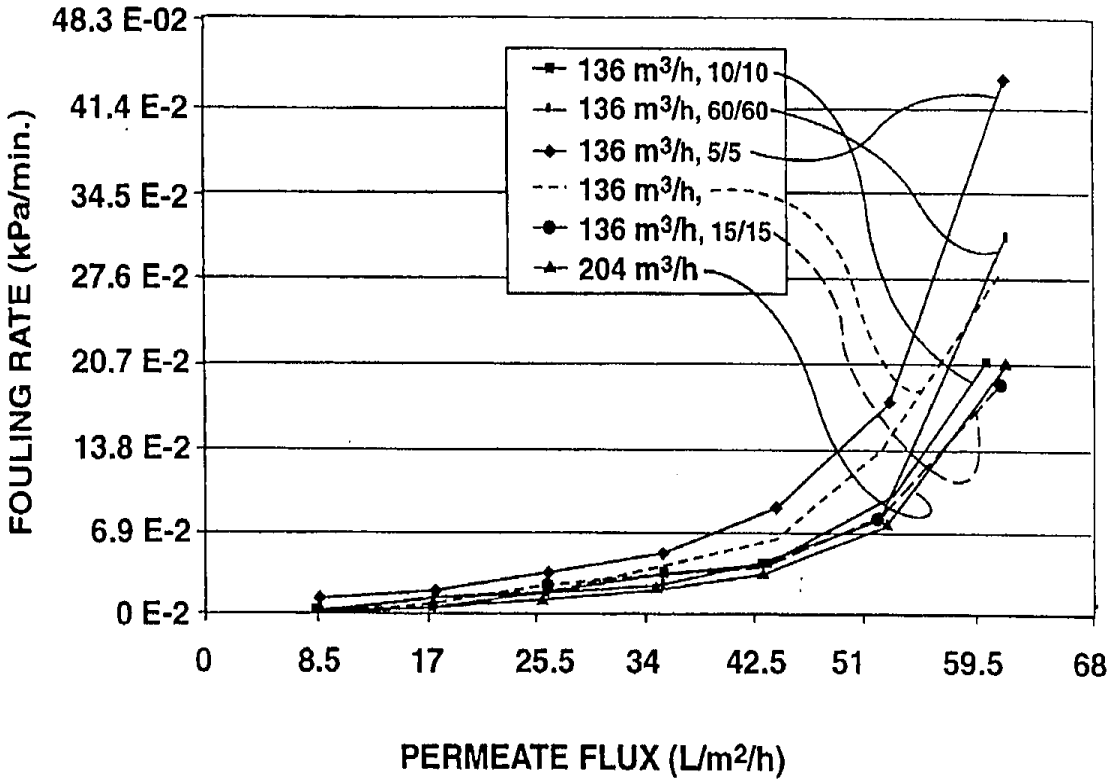

48.3 E-02
41.4 E-2
34.5 E-2
27.6 E-2
20.7 E-2
13.8 E-2
6.9 E-2
0 E-2
FOULING RATE (kPa/min.)
136 m3/h, 10/10
136 m3/h, 60/60
136 m3/h, 5/5
136 m3/h,
136 m3/h, 15/15
204 m3/h
0
8.5
17
25.5
34
42.5
51
59.5
68
PERMEATE FLUX (L/m2/h)

FIG. 10A

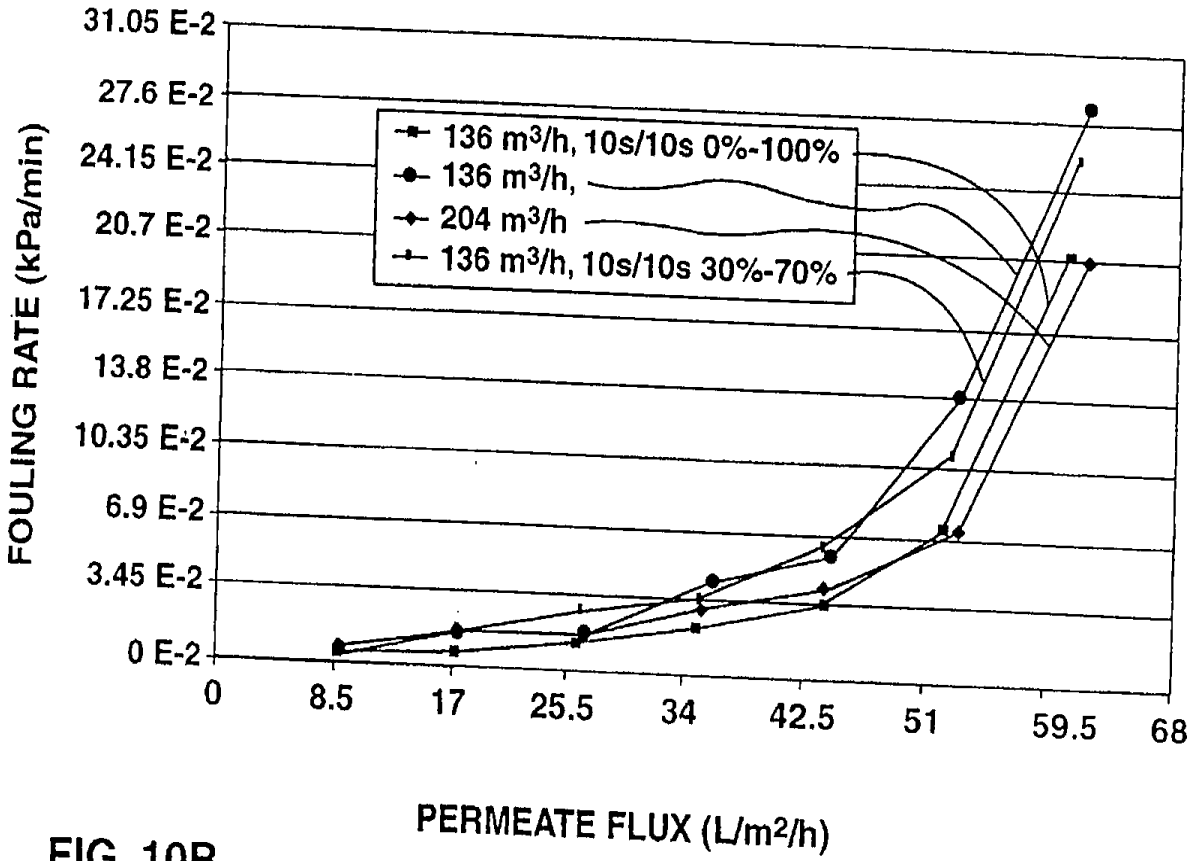

31.05 E-2
27.6 E-2
24.15 E-2
20.7 E-2
17.25 E-2
13.8 E-2
10.35 E-2
6.9 E-2
3.45 E-2
0 E-2
FOULING RATE (kPa/min)
136 m3/h, 10s/10s 0%-100%
136 m3/h,
204 m3/h
136 m3/h, 10s/10s 30%-70%
0
8.5
17
25.5
34
42.5
51
59.5
68
PERMEATE FLUX (L/m2/h)

FIG. 10B

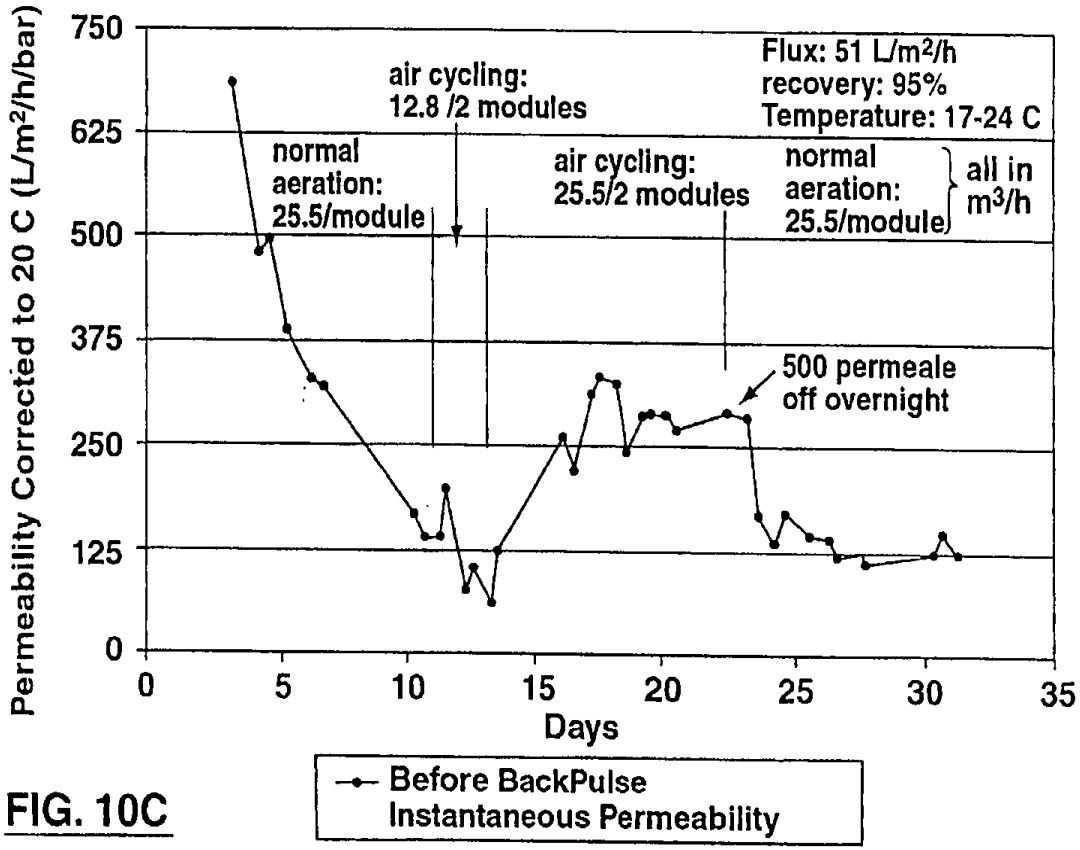

Permeability Corrected to 20 C (L/m²/h/bar)
750
625
500
375
250
125
0
0
5
10
15
20
25
30
35
Days
Flux: 51 L/m²/h
recovery: 95%
Temperature: 17-24 C
air cycling:
12.8 /2 modules
normal
aeration:
25.5/module
air cycling:
25.5/2 modules
normal
aeration:
25.5/module
all in
m³/h
500 permeale
off overnight
Before BackPulse
Instantaneous Permeability

FIG. 10C

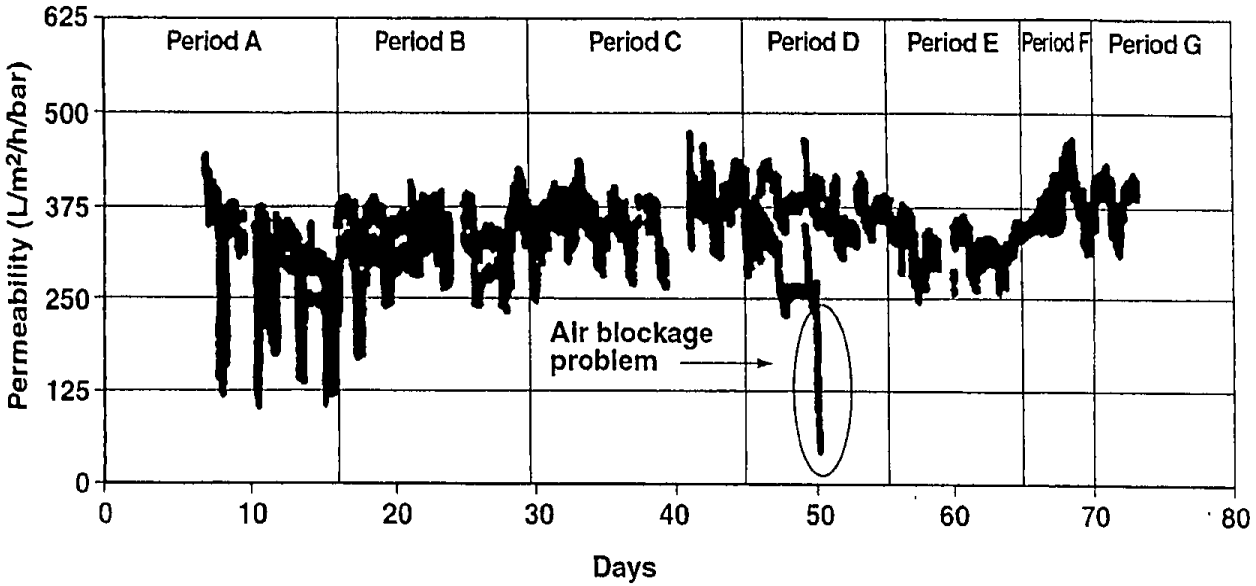

Period A
Period B
Period C
Period D
Period E
Period F
Period G
Air blockage problem
Permeability (L/m²/h/bar)
625
500
375
250
125
0
0
10
20
30
40
50
60
70
80
Days

FIG. 11

Fig 12.

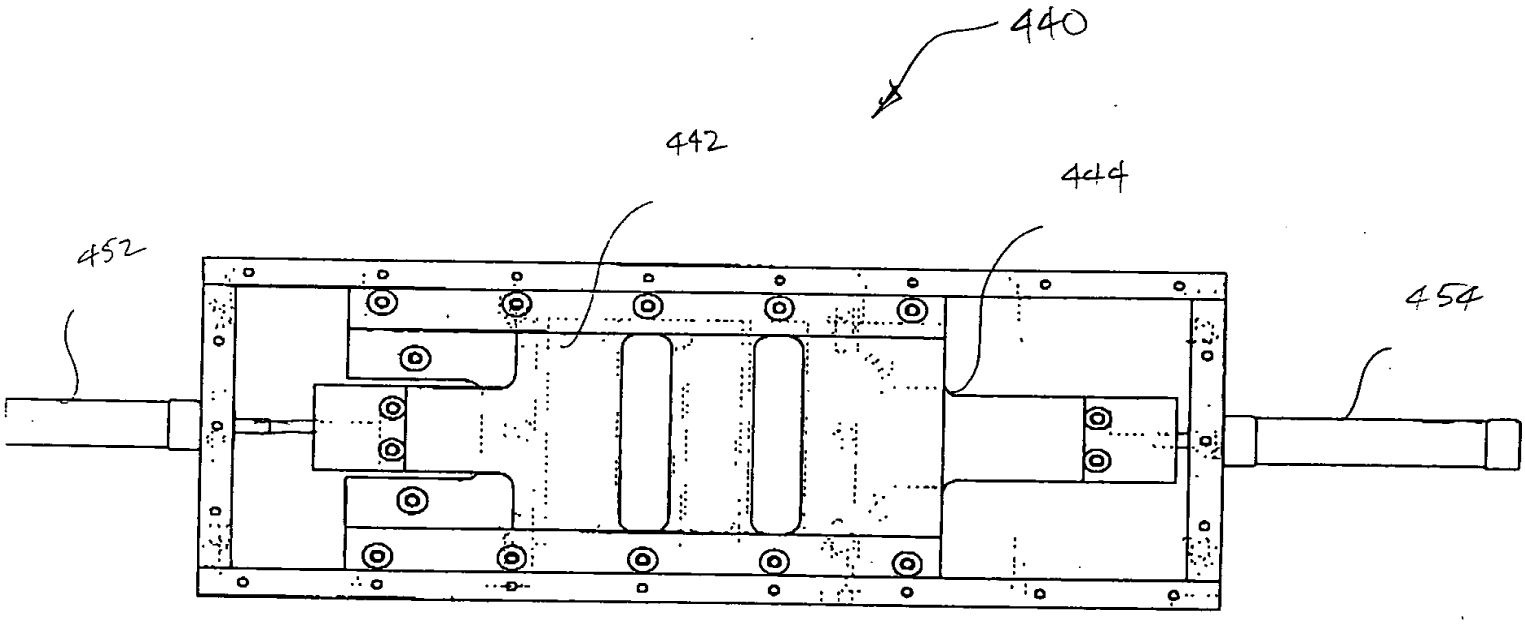


FIG. 13A

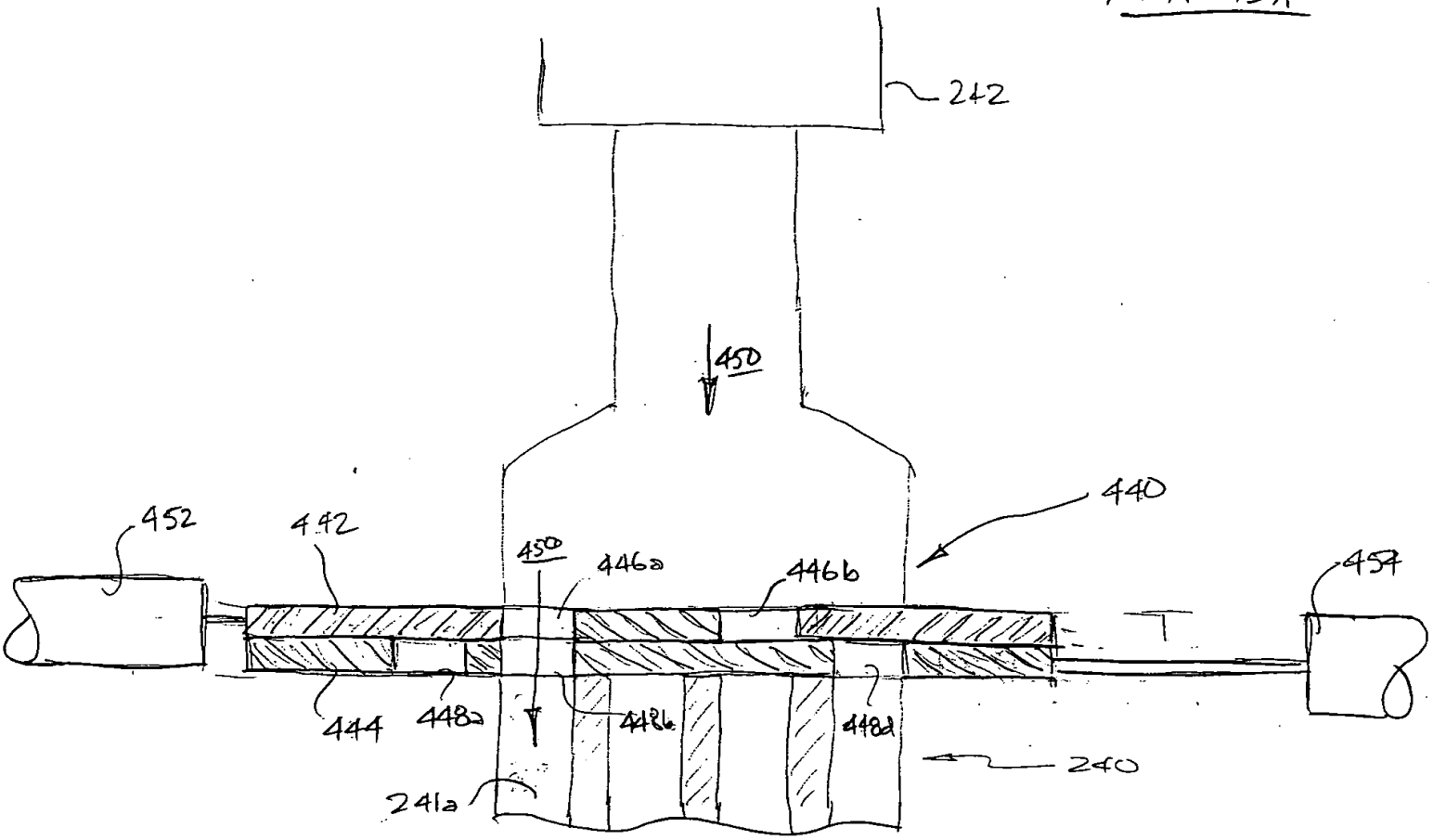


FIG. 13B

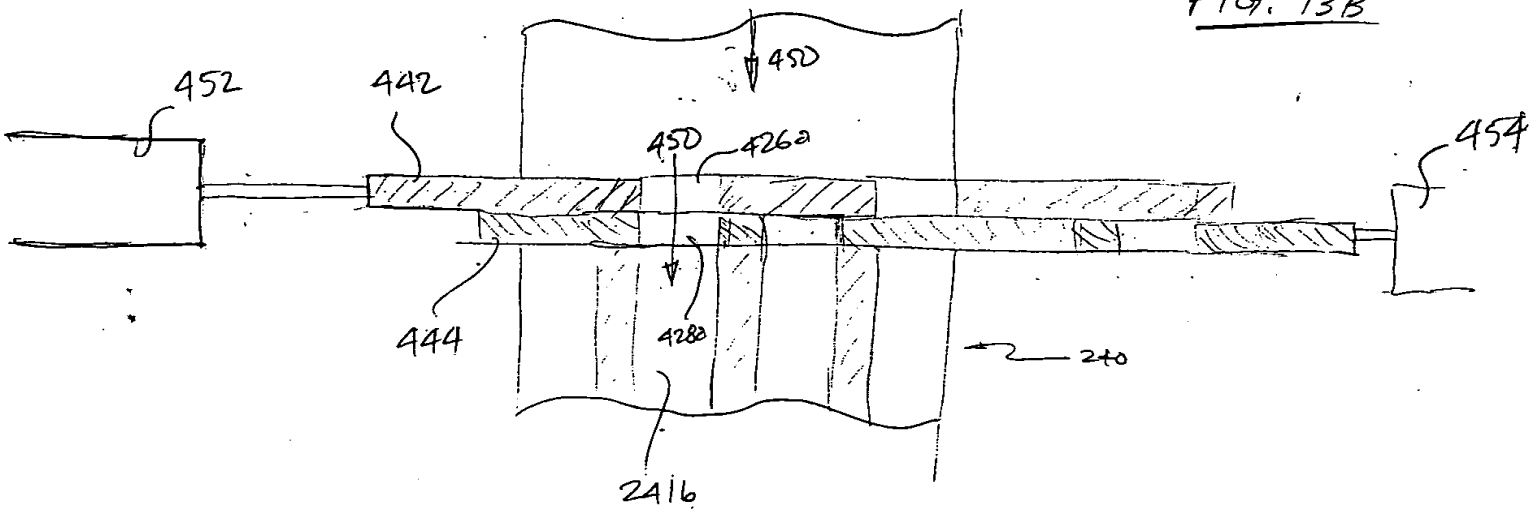


FIG. 13C

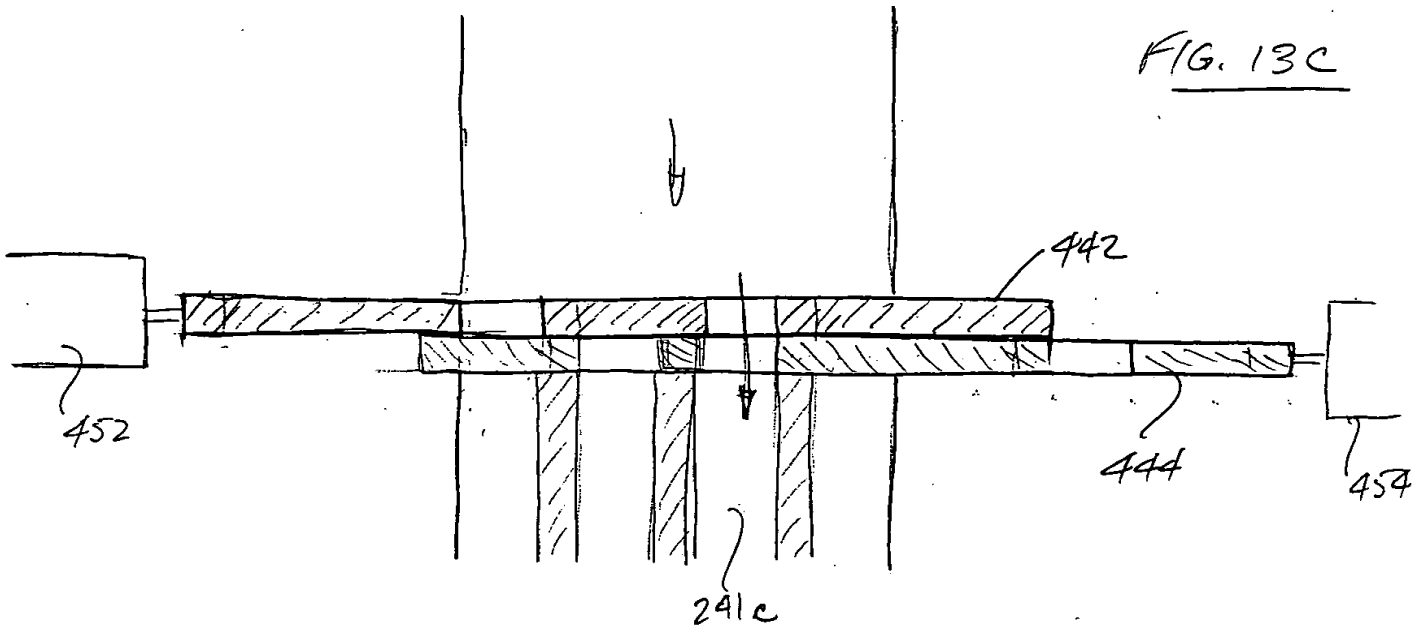


FIG. 13D

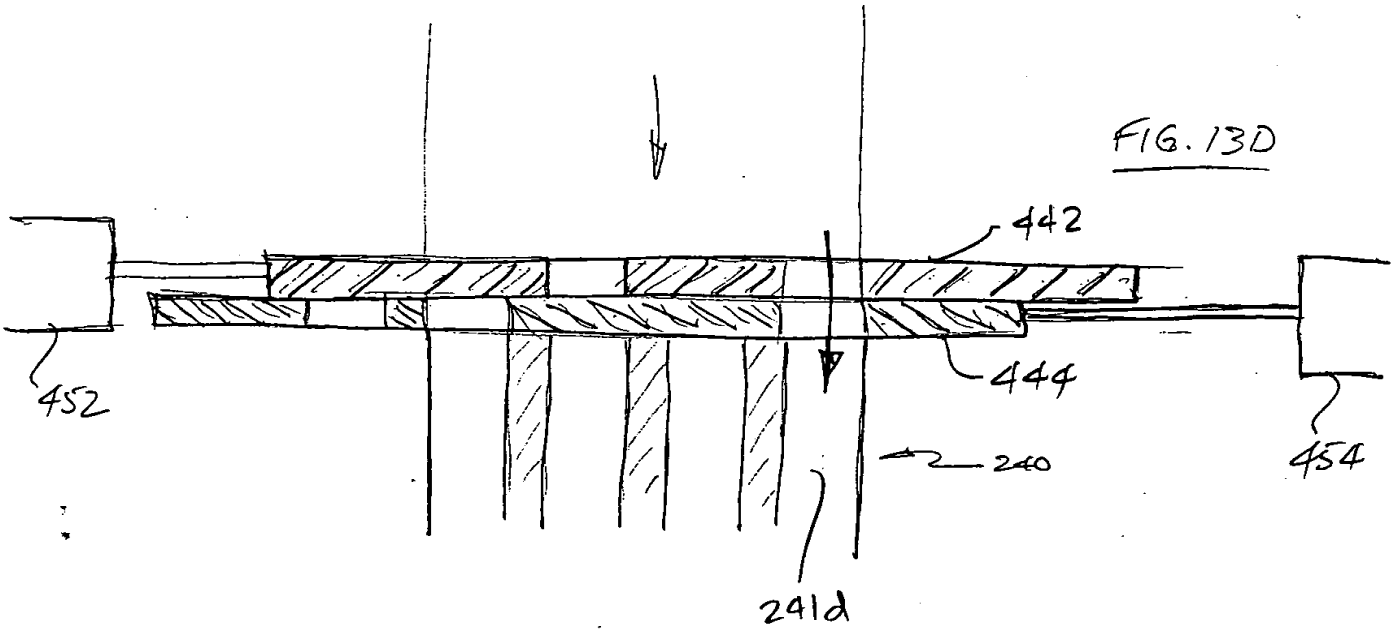
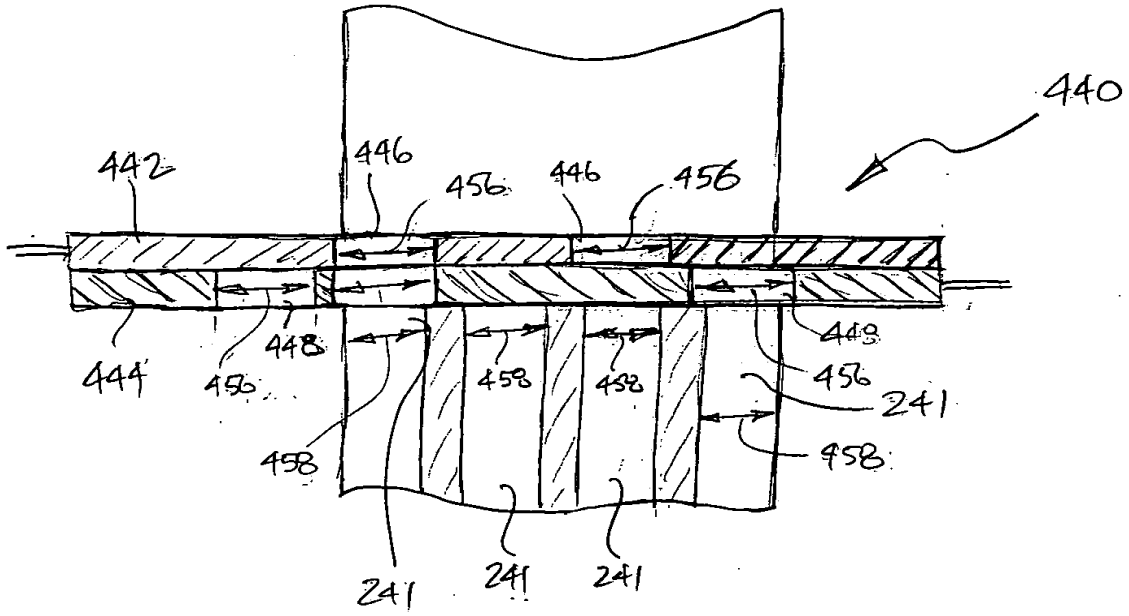


FIG 14.


440
442
446
456
446
456
444
456
448
448
456
458
458
458
458
241
241
241
241